THE SIGNIFICANCE OF OVIPOSITION RATES IN THE EGG PARASITE, TRICHOGRAMMA EMBRYOPHAGUM HTG.

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I. INTRODUCTION

The free living adults of entomophagous parasites, often named parasitoids, deposit their eggs or young larvae in (or on) the egg, larval or pupal stages of an insect. The parasitic larvae feed upon their host’s blood or tissues, pupate in or outside its chorion or cuticle after its final death, and subsequently give rise to adult parasites.
When a host is superparasitized with more parasite larvae than it is able to feed, competition for food may be expected to occur. However, many parasitic species have evolved behavioural mechanisms for avoiding the disadvantageous effects of this struggle for life. First, under natural conditions, many parasites have one main host, and the number of eggs laid is adapted to the size of this host. Secondly, it has been observed in some polyphagous species that the number of eggs deposited varies according to the size of the host. Thirdly, many species, but not all, are able to discriminate parasitized and non-parasitized hosts, and do not normally infect the first category unless the number of hosts available for infection is low. Superparasitism, therefore, seems to be a relatively rare phenomenon, which will only regularly occur in particular species and under certain conditions, such as high parasite density or low host density.

Salt (1961) has reviewed what happens when the number of parasite eggs deposited is excessive for the size of the host. In solitarily parasitic species, which deposit one egg in a host providing food for one parasite only, the larvae, when both in the first instar, attack each other physically. These larvae are armed with robust mandibles suitable for attack. One larva fixes its mandibles in the body of the other until the victim becomes supine, and then it suddenly releases and moves away.

In other cases, when superparasitism occurs at the time that the first parasite larva is in the second or third instar, the invader may be suppressed physiologically. It was shown by Fisher (1961; 1963), that in Nemeritis canesceens Thomson the suppression is due to lack of oxygen.

In all cases the result is that no food is wasted and one parasite develops to the adult stage in the normal way. The scramble type of competition for food is avoided.

In gregariously parasitic species, the larvae of which develop in a small group in one host, physical attack and physiological suppression do not occur. When a host is superparasitized to a light degree, one or more of the larvae die, and the others may give rise to undersized or stunted adults, because part of the food is wasted. In the case of heavy superparasitization all larvae die, because no one can take in enough food to reach the minimum weight necessary for pupation. In such parasites scramble among larvae is a general phenomenon.

The chalcid Trichogramma is a polyphagous parasite of eggs of representatives of various insect orders, mainly Lepidoptera. It oviposits in eggs of very different sizes, and in general the number of eggs deposited per oviposition increases with an increase of host size (Quednau, 1960; Klomp and Teerink, 1962). This raises the interesting question of whether the number of eggs deposited is adapted to host size so as to minimize the deleterious effects of scramble among the larvae, and to